

# EMC Technologies (NZ) Ltd

Test Report No 40855.2

Report date: 5<sup>th</sup> October 2004

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## **TEST REPORT**

### **Cabco Kid Kart Shopping Trolley Transmitter**

*tested to*

### **47 Code of Federal Regulations**

#### **Part 15 - Radio Frequency Devices**

#### **Subpart C – Intentional Radiators**

*for*

#### **Cabco Group Ltd**

This Test Report is issued with the authority of:

*Andrew Cutler*  
**Andrew Cutler - General Manager**

Prepared By:

*Cecilia Lam*

**Cecilia Lam - Office Administrator**



All tests reported  
herein have been  
performed in accordance  
with the laboratory's  
scope of accreditation

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## 1. STATEMENT OF COMPLIANCE

The **Cabco Kid Kart Shopping Trolley Transmitter** complies with FCC Part 15 Subpart C as an Intentional Radiator when the methods, as described in ANSI C63.4 - 1992, are applied.

## 2. RESULTS SUMMARY

Clause	Parameter	Result
15.201	Equipment authorisation requirement	Certification required.
15.203	Antenna requirement	Complies. Antenna is integral to the device.
15.204	External PA and antenna modifications	Not applicable. No external devices.
15.205	Restricted bands of operation	Complies. Device transmits on 915.400 MHz
15.207	Conducted limits	Not applicable. Device is powered by internal batteries that are removed when charging is required.
15.209	Radiated emission limits	Complies with a 0.2 dB margin at 66.350 MHz.
15.249 (a)	Field strength of fundamental and harmonics	Complies with an 0.1 dB margin at 1830.280 MHz (Vertical) when an average detector was used.

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## **3. INTRODUCTION**

This report describes the tests and measurements performed on the **Cabco Kid Kart Shopping Trolley Transmitter** for the purpose of determining compliance with the specification.

**The client selected the test sample.**

**This report relates only to the sample tested.**

**This report contains no corrections or erasures.**

Measurement uncertainties with statistical confidence intervals of 95% are shown below test results. Both Class A and Class B uncertainties have been accounted for, as well as influence uncertainties where appropriate.

## **4. CLIENT INFORMATION**

**Company Name** Cabco Group Ltd

**Address** PO Box 302-839  
North Harbour

**City** Auckland

**Country** New Zealand

**Contact** Mr Brendon Haworth

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## 5. DESCRIPTION OF TEST SAMPLE

<b>Brand Name</b>	Cabco
<b>Model Number</b>	Kid Kart
<b>Product</b>	Shopping Trolley Transmitter
<b>Manufacturer</b>	Cabco Group Ltd
<b>Country of Origin</b>	New Zealand
<b>Serial Number</b>	501
<b>Ancillary Equipment</b>	Nil

The device tested is a transmitter that is located in a shopping trolley.

This transmitter is used in conjunction with a control transmitter which is normally located at the entry to the supermarket shopping centre near the shopping trollies.

The transmitter in the shopping trolley is normally inactive.

When a shopping trolley is hired the controller will poll all available trollies and releases the brake of the the nearest available trolley.

At this time the transmitter in the trolley transmits a briefly to the control station indicating that the trolley has been hired and the brakes are released

Once the brakes are release an MP3 player is activated that plays music.

The trolley transmitter then remains inactive until the brakes are reapplied which occurs approximately 5 minutes after it passes through the check out at which point the trolley detects an optical input.

When the brakes are reapplied the trolley transmits to the control station indicating that it is now available for hire.

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## 6. RESULTS

### Standard

The sample was tested in accordance with 47 CFR Part 15 Subpart C.

### Methods and Procedures

The measurement methods and procedures as described in ANSI C63.4 - 1992 were used.

### Section 15.201: Equipment authorisation requirement

Certification as detailed in Subpart J of Part 2 is required for this device.

### Section 15.203: Antenna requirement

As can be seen from the attached photographs the antenna for this device is permanently attached to the transmitter. The transmitter is contained within a locked compartment on the trolley that cannot be easily accessed and therefore it cannot be easily modified.

**Result:** Complies.

### Section 15.204: External radio frequency power amplifiers and antenna modifications

From the attached photographs it can be seen that it is not possible to attach an external power amplifier to this transmitter.

**Result:** Complies.

### Section 15.205: Restricted bands of operation

The transmitter transmits on 915 MHz and is therefore covered by Section 15.249 of these rules.

**Result:** Complies.

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## **Section 15.207: Conducted limits**

Not applicable as the device is powered using 2 internal batteries which are removed from the device in order to be charged.

## **Section 15.209: Radiated emission limits, general requirements**

Radiated emissions testing was carried out over the frequency range of 30 MHz to 1000 MHz for all other emissions other than the fundamental and harmonic emissions

The fundamental and harmonic emissions are covered by Section 15.249.

Testing was carried out in accordance with EMC Technologies Ltd registration with the Federal Communications Commission as a listed facility, registration number: 90838, which was last updated on February 17<sup>th</sup>, 2004.

Testing was carried out at the laboratory's open area test site - located at Driving Creek, Orere Point, Auckland, New Zealand.

This site conforms to the requirements of CISPR 16, Part 1, Clause 16, and ANSI C63.4 - 1992.

The device was placed on the test tabletop, which is a total of 0.8 m above the test site ground plane.

When an emission is located, it is positively identified and its maximum level is found by rotating the automated turntable, and by varying the antenna height, where appropriate, with an automated antenna tower.

Emissions are measured in both vertical and horizontal antenna polarisations, where appropriate.

The emission level was determined in field strength by taking the following into consideration:

$$\text{Level (dB}\mu\text{V/m)} = \text{Receiver Reading (dB}\mu\text{V)} + \text{Antenna Factor (dB)} + \text{Coax Loss (dB)}$$

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## Section 15.209: Spurious Emissions (above 30 MHz)

Measurements were made between 30 –9000 MHz have been made at a distance of 3 metres.

Measurements were made while the device was being powered using a 12 Vdc internal power supply consisting of batteries.

A receiver with a quasi peak detector with a 120 kHz bandwidth was used between 30 – 1000 MHz.

A number of emissions were observed.

The limits as described in Section 15.209 have been applied as follows:

30.0 – 88.0 MHz	100 uV/m	40 dBuV/m
88.0 – 216.0 MHz	150 uV/m	43.5 dBuV/m
216.9 – 960.0 MHz	200 uV/m	46.0 dBuV/m

**Result:** Complies with a 0.2 dB margin at 66.350 MHz (Vertical).

Measurement falls within the window of uncertainty for this test method.

Measurement uncertainty with a confidence interval of 95% is:

- Free radiation tests (30 – 1000 MHz) ± 4.1 dB

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## Other Spurious Emissions

Frequency MHz	Level dBuV/m		Recheck dBuV/m	Limit dBuV/m	Margin dB	Result	Worst Case Antenna
30.400	33.1			40.0	6.9	Pass	Vertical
33.150	24.5			40.0	15.5	Pass	Vertical
44.250	33.5	32.4		40.0	6.5	Pass	Vertical
46.100	32.7			40.0	7.3	Pass	Vertical
60.850	39.1	27.5		40.0	0.9	Pass	Vertical
61.750	34.5	24.0		40.0	5.5	Pass	Vertical
66.350	39.8	37.4		40.0	0.2	Pass	Vertical
68.200	36.6			40.0	3.4	Pass	Vertical
110.600	42.0	41.8		43.5	1.5	Pass	Vertical
114.300	32.0	30.4		43.5	11.5	Pass	Vertical
121.700	32.6	31.4		43.5	10.9	Pass	Vertical
129.000	36.0	37.5		43.5	6.0	Pass	Horizontal
132.700	33.2	34.5		43.5	9.0	Pass	Horizontal
140.100	26.2			43.5	17.3	Pass	Vertical
151.500	34.0			43.5	9.5	Pass	Vertical
154.800	32.4	33.5		43.5	10.0	Pass	Horizontal
162.200	26.9			43.5	16.6	Pass	Vertical
164.400	29.0			43.5	14.5	Pass	Vertical
199.100	24.5			43.5	19.0	Pass	Vertical
221.150	23.3			46.0	22.7	Pass	Vertical
224.900	27.4			46.0	18.6	Pass	Vertical
228.500	23.5			46.0	22.5	Pass	Vertical
232.250	27.4	27.5		46.0	18.5	Pass	Horizontal
243.350	37.6	38.9		46.0	7.1	Pass	Horizontal
254.450	27.2	25.4		46.0	18.8	Pass	Vertical
265.400	41.5	44.5		46.0	1.5	Pass	Horizontal
276.500	34.5	37.8		46.0	8.2	Pass	Horizontal
287.600	34.7	35.6		46.0	10.4	Pass	Horizontal
294.990	20.6	22.5		46.0	23.5	Pass	Horizontal

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## Section 15.249 Operation within the band 902 – 928 MHz:

### Section 15.249 (a)

The fundamental emission were observed to be operating on 915.140 MHz

A limit of 50 mV/m (94 dBuV/m) has been applied.

Measurements were made at a distance of 3 metres using a receiver with a quasi peak detector and a 120 kHz bandwidth.

Frequency MHz	Level dBuV/m	Limit dBuV/m	Margin dB	Antenna Polarisation	Result
915.140	91.2	94.0	-2.8	Vertical	Pass
915.140	91.1	94.0	-2.9	Horizontal	Pass

The following harmonics were observed.

Average measurements were made using a 1 MHz detector bandwidth as per section 15.35(b).

A limit of 500 uV/m (54.0 dBuV/m) has been applied to these measurements.

Frequency MHz	Level dBuV/m	Limit dBuV/m	Margin dB	Antenna Polarisation	Result
1830.280	53.9	54.0	-0.1	Vertical	Pass
1830.280	52.9	54.0	-1.1	Horizontal	Pass
2745.420	51.4	54.0	-0.1	Vertical	Pass
2745.420	49.1	54.0	-4.9	Horizontal	Pass

No further emissions observed to exceed 34 dBuV/m in the range 2.7 – 9.2 GHz when measurements were attempted using vertical or horizontal polarisations.

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Peak measurements were also made using a 1 MHz detector bandwidth as per section 15.35(b).

A limit of 500 uV/m (54.0 dBuV/m) + 20 dB has been applied to these measurements.

Frequency MHz	Level dBuV/m	Limit dBuV/m	Margin dB	Antenna Polarisation	Result
1830.280	51.0	74.0	-13.0	Vertical	Pass
1830.280	50.0	74.0	-24.0	Horizontal	Pass
2745.420	61.6	74.0	-12.4	Vertical	Pass
2745.420	58.0	74.0	-16.0	Horizontal	Pass

No further emissions observed to exceed 45.0 dBuV/m in the range 2.7 – 9.2 GHz when measurements were attempted using vertical or horizontal polarisations.

Testing was carried out at the laboratory's open area test site - located at Driving Creek, Orere Point, Auckland, New Zealand.

The device was placed on the test tabletop, which is a total of 0.8 m above the test site ground plane.

When an emission is located, it is positively identified and its maximum level is found by rotating the automated turntable, and by varying the antenna height, where appropriate, with an automated antenna tower.

Emissions are measured in both vertical and horizontal antenna polarisations, where appropriate.

The emission level was determined in field strength by taking the following into consideration:

Level (dB $\mu$ V/m) = Receiver Reading (dB $\mu$ V) + Antenna Factor (dB) + Coax Loss (dB) – Preamplifier Gain (dB)

**Result:** Complies

Measurement uncertainty with a confidence interval of 95% is:

- Free radiation tests (100 kHz – 30 MHz)  $\pm$  4.8 dB

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## 7. TEST EQUIPMENT USED

Instrument	Manufacturer	Model	Serial No	Asset Ref
Aerial Controller	EMCO	1090	9112-1062	RFS 3710
Aerial Mast	EMCO	1070-1	9203-1661	RFS 3708
Biconical Antenna	Schwarzbeck	BBA 9106	-	RFS 3612
Log Periodic Antenna	Schwarzbeck	VUSLP9111	9111-228	RFS 3702
Horn Antenna	EMCO	3115	9511-4629	E1495
Spectrum Analyser	Hewlett Packard	E7405A	US39150142	3776
Measurement Receiver	Rohde & Schwarz	ESCS 30	847124/020	E1595
Pre amplifier	Mini Circuits	ZHL-42	060484	RFS 3784
Turntable	EMCO	1080-1-2.1	9109-1578	RFS 3709
VHF Balun Antenna	Schwarzbeck	VHA 9103	-	RFS 3603

## 8. ACCREDITATIONS

Testing was carried out in accordance with EMC Technologies Ltd registration with the Federal Communications Commission as a listed facility, registration number: 90838, which was last updated on February 17<sup>th</sup>, 2004.

All testing was carried out in accordance with the terms of EMC Technologies (NZ) Ltd International Accreditation New Zealand (IANZ) Accreditation to NZS/ISO/IEC 17025.1999.

All measurement equipment has been calibrated in accordance with the terms of the EMC Technologies (NZ) Ltd International Accreditation New Zealand (IANZ) Accreditation to NZS/ISO/IEC 17025.1999.

International Accreditation New Zealand has Mutual Recognition Arrangements for testing and calibration with 46 accreditation bodies in 34 economies. This includes NATA (Australia), UKAS (UK), SANAS (South Africa), NVLAP (USA), A2LA (USA), SWEDAC (Sweden). Further details can be supplied on request.

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## 9. PHOTOGRAPH (S)

### External Photos



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## Internal Photos



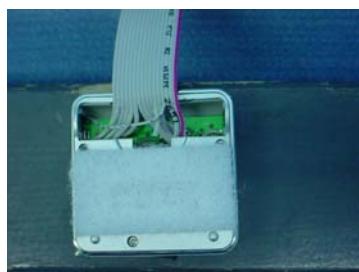
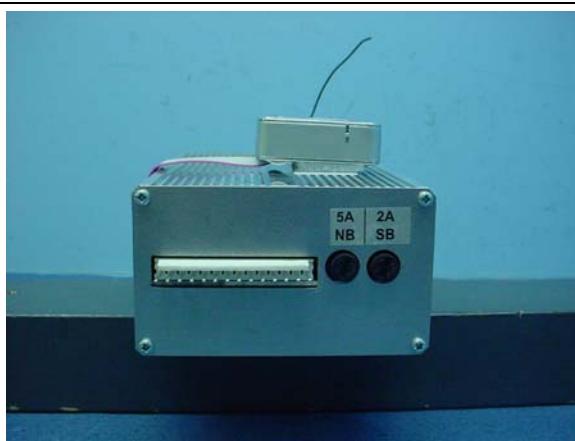
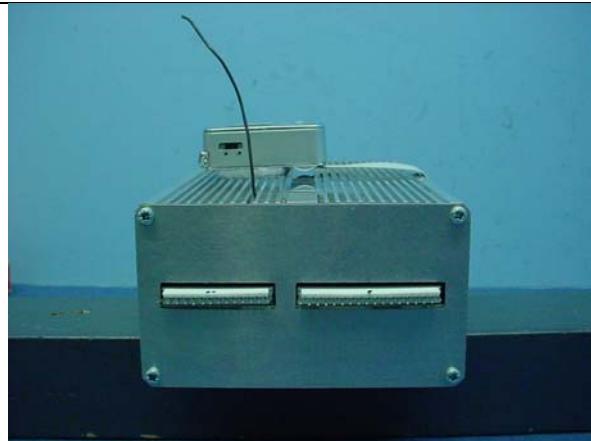
## Transmitter



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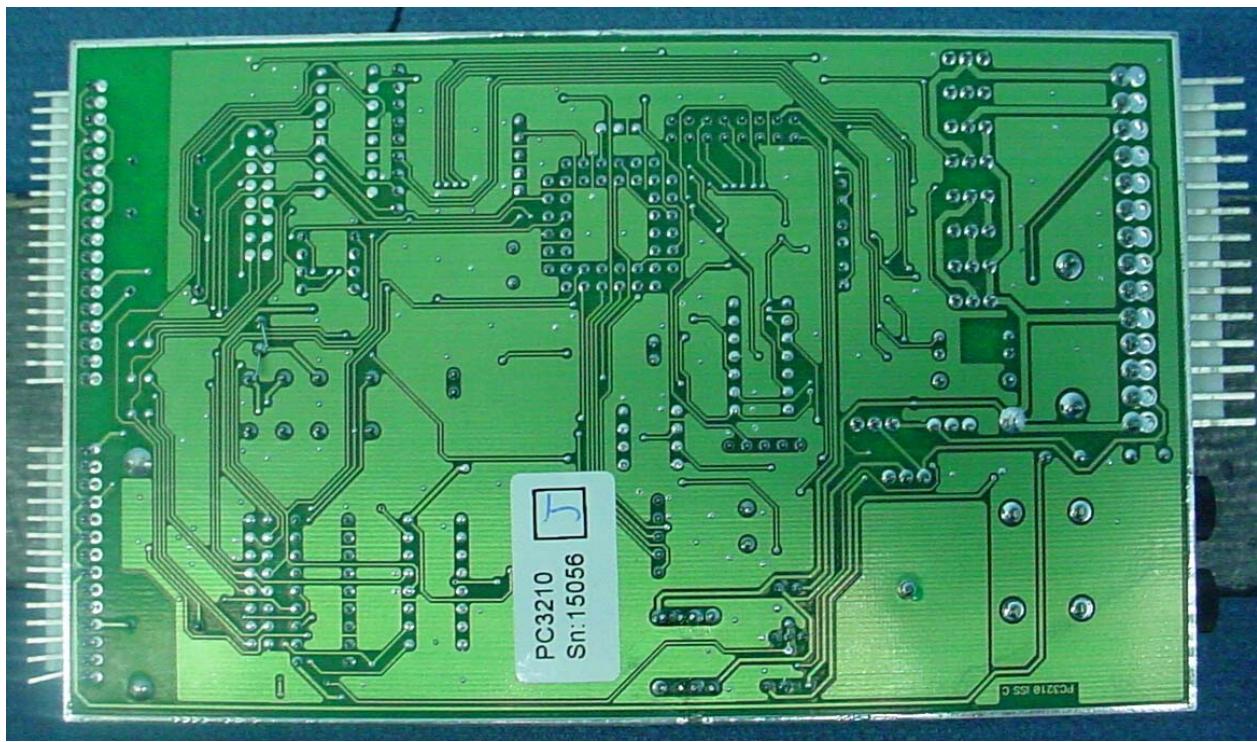
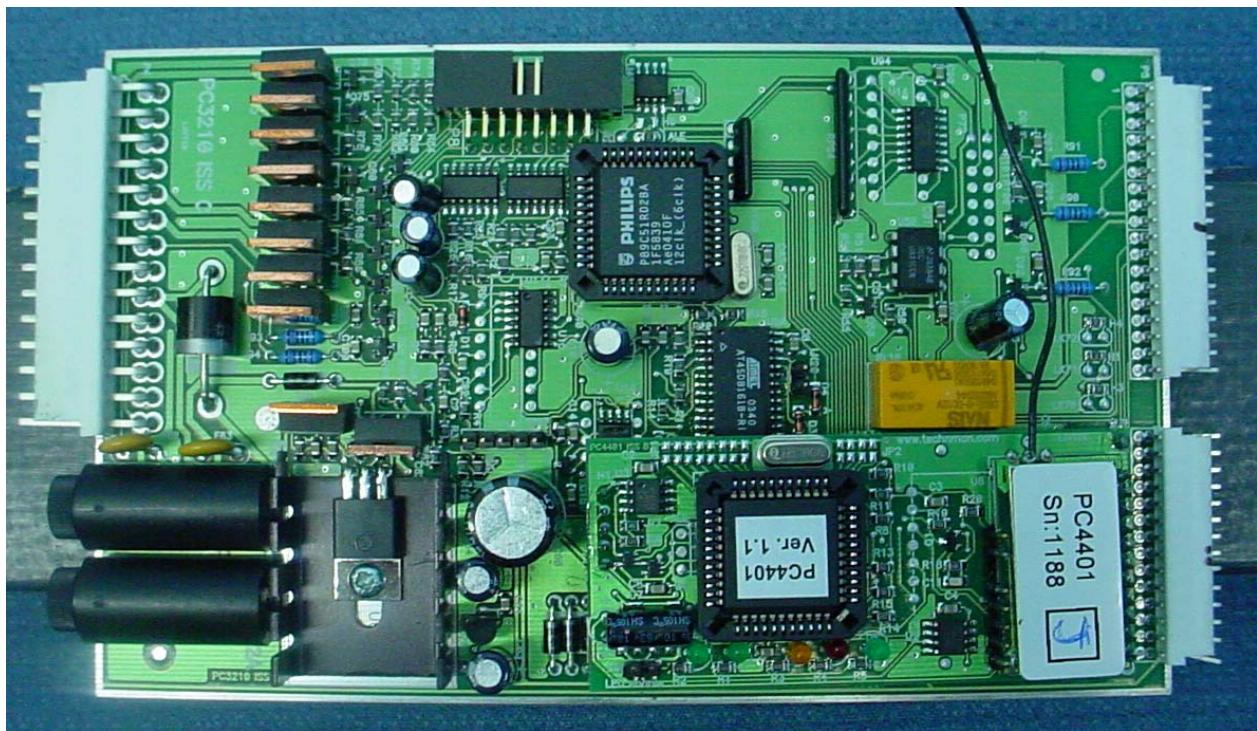
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## Transmitter internal circuit boards



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## Radiated emission test set up photos



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